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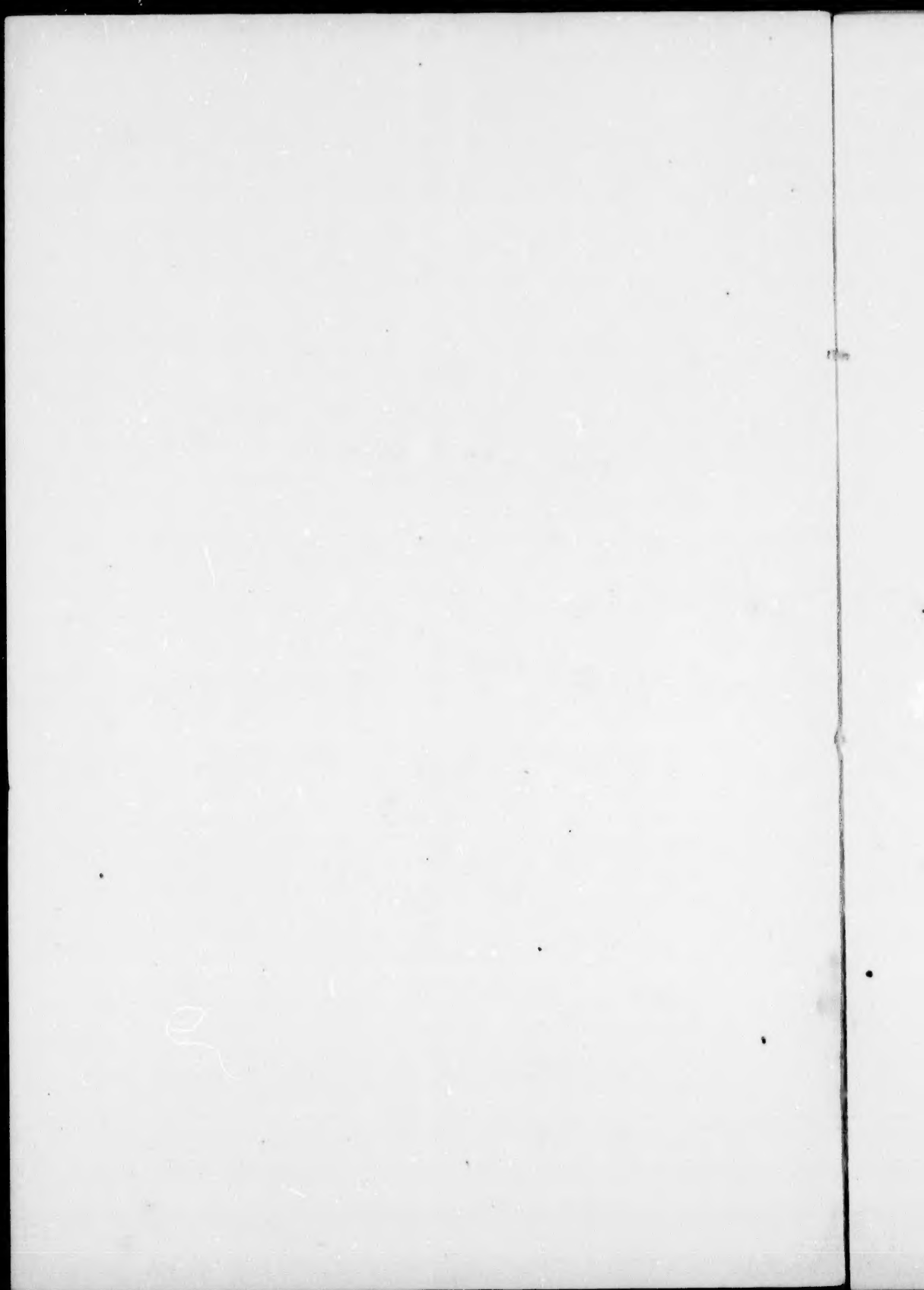
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SYSTOLIC BRAIN MURMUR
OF
CHILDREN.

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ON THE
SYSTOLIC BRAIN MURMUR OF CHILDREN.

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I DESIRE in the following communication to call attention to this interesting clinical phenomenon, first described by Dr. J. Fisher, of Boston, in the *Medical Magazine* for 1833. Like many other observations, this one has suffered from the lapse of time, and has been, to a great extent, forgotten and neglected. In conversation with many physicians, some of them specially connected with pediatrics, I have been surprised to find how few were even aware of the existence of such a murmur. Very cursory mention is made of it in works on auscultation and, with a few exceptions, those on diseases of children. Up to 1863 the German and French physicians had written many papers on the subject, and within the past few years interest has been re-aroused in it by the publication of important memoirs by Jurasz¹ and Epstein.² English and American physicians have not given it much attention, and in the literature as collected by Jurasz the only references are Whitney, the *American Journal Medical Sciences*, 1843, and J. W. Smith, the *Lancet*, 1839.

In the autumn of 1876, I was asked by a medical friend to see a child, aged three years, with a remarkable murmur in the head, about which the parents

¹ Das systolische Hirngeräusch der Kinder. Heidelberg. 1877.

² Beitrag zur Kenntniss des systolischen Schädelgeräusches der Kinder. Prag. 1878.

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were very anxious. The child was a well-nourished little girl, with a ruddy complexion, well-formed head, fontanelles closed; no evidences of rickets. On placing the ear upon any part of the head a loud, high-pitched systolic murmur could be heard, variable in intensity, loudest in the temporal regions, also audible in the carotids, and disappearing entirely on compression of these vessels. There was no heart disease. The mother had noticed the noise in the head, she thought, from the time the child was a year old, and the child also appeared conscious of its presence, but said she only heard it at intervals. The medical attendant had suggested the possibility of aneurism, but there did not seem to me to be any evidence in favor of such a view. I had a distinct recollection of the fact that a murmur was described as occurring in the brains of children, but I thought it was always audible over an open fontanelle, and partaking of the nature of a venous hum, originating in the longitudinal sinus. As the child was in good health, and the murmur had persisted for nearly two years, I gave a favorable prognosis. The mother did not appear satisfied, but I heard nothing further of the case for some months, when I recognized it in the description of a Case of Supposed Gummy Tumor of the Brain, in which the murmur was attributed to the possible existence of a syphilitic growth pressing upon the vessels at the base of the brain. About the same time Jurasz's memoir came to hand, and renewed my interest in the case, which has proved to be one of unusual value from the length of time which the murmur has continued. The history of the child from the spring of 1877 to the present is as follows: she has thriven, and is now a bright, intelligent little girl of seven, perfectly healthy, head not enlarged, and no trace of swollen lymphatic glands in the neck. I have examined her on four occasions, and found the murmur persistent, with the same characteristics. On the 15th of May of the present year I examined her again, and found it still very

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distinct, loudest in the temporal regions, rather more variable in intensity than hitherto, and sometimes disappearing entirely for a few moments. It was with difficulty heard in the carotids.

I have examined about sixty children for this murmur, and have discovered it in eight cases, all under three years of age: one, a case of chronic hydrocephalus; one, chronic intestinal catarrh with rickets; the others appeared healthy. Among the sick children examined in whom no murmur existed were several cases of rickets, two of tuberculous meningitis, and one of chronic hydrocephalus. Dr. James Bell, late house surgeon of the Montreal General Hospital, examined one hundred children, and found only six instances of the "brain murmur;" but, as he remarked, the difficulty of detecting a soft, low-pitched *bruit* in the head of a struggling child in a busy, "out-door" room makes it probable that in many instances it was overlooked. No special note was kept in these cases of the condition of the children.

Observers differ very much in their estimation of the import of this murmur, some regarding it as pathological, others as physiological. Dr. Fisher thought it to be the former, and described variations of the murmur in such diseases as whooping-cough, congestion of the brain, acute and chronic hydrocephalus, and apoplexy. Barthez and Rilliet (1853) thought that it afforded a diagnostic sign between rachitic hypertrophy of the brain and chronic hydrocephalus. Roger (1859) and Henoch (1861) regarded it as specially connected with rickets. Wirthgen (1855), on the other hand, believed it to be physiological, and states that it is heard most frequently over the heads of robust children. The views of these and other writers are given very fully in Jurasz's monograph, and the discordance of opinion is amply illustrated. This author concludes that it is not pathological, but occurs in both healthy and diseased children, and does not stand in direct connection with any particular disease. In reading over the rec-

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ords of cases it is certainly noteworthy how frequent the subject of the murmur is described as rickety.

There is remarkable unanimity among all the writers as to the age at which the murmur prevails, the extremes in the recorded cases being the third month and the sixth year, the majority of instances occurring during the second year. The case of the little girl above given is of interest, therefore, in this connection, as she is now over seven years of age, and further from the fact of the persistence of the murmur since infancy. I have not found any recorded instance of the murmur persisting for such a length of time.

The seat of the production of the murmur is placed by most authors in the arteries at the base of the brain and in the carotid canal. Hennig believed it to be venous, and produced in the longitudinal sinus. It is worthy of note that in the majority of the cases a murmur is also heard in the carotid arteries.

Jurasz has brought forward evidence to prove that the murmur originates in the carotid canal, and as his explanation of it has not, so far as I know, been published in any English or American journal, it may be worth while to give a summary of his views: He measured the width of the upper and lower orifices of the carotid canal in twenty-five adults and twenty-five new-born infants. In the former the inferior aperture varied from 6.4 m. to 1 cm. in the long, and 5.4 to 7.6 m. in the short diameter; the superior aperture from 5.4 to 8 m. in the longest, and 5.3 to 7.4 m. in the shortest diameter. Measurements in the mature fœtus and new-born when compared with these show a difference of from 4.1 to 6.2 m. for the long, and 3.7 to 4.6 m. for the short diameter of the inferior aperture, and 3.1 to 4.3 m. for the long, and 3.3 to 3.9 m. for the short diameter of the superior aperture. The carotid canal must therefore enlarge considerably in the course of development. Does this take place gradually, or does it occur more rapidly at one period than another? His observations and measurements go to show that up

to the sixth month the canal does not enlarge, remaining unchanged; but from this date it widens rapidly, so that from the third to the sixth year the dimensions of the adult canal are attained. The enlargement is held to be due to the increase in volume of the carotid artery, and not to an independent growth, that is, expansion, of the bone; and this being the case it is not impossible that a temporary local disproportion ensues between the rapidly enlarging carotid artery and the surrounding bony wall, or, "in other words, a temporary stenosis of the carotid takes place in the carotid canal." This physiological stenosis is held to be the cause of the systolic brain murmur, which is to be regarded as a normal occurrence. It is the expression of a struggle between the artery and its bony investment, which persists until by the pressure of the pulsations the canal has been widened to a suitable degree.

Epstein¹ criticises this theory and the anatomical data on which it is based, denying the rapid expansion of the carotid canal after the sixth month and its enlargement by the pulsation of the artery. Taking the following circumstances as favoring the production of vascular murmurs, namely, wide vessels, rapid blood flow, diminished peripheral resistance, elasticity, and thinness of the walls, he proceeds to show that these prevail to an unusual degree in infancy, particularly in the vessels of the head, which, according to Beneke, are relatively larger than the others of the body. In children, also, the arterial walls are thinner, the capillaries wider, the blood flow more rapid, and consequently the blood pressure is low. The existence of such conditions, especially in anæmic children, is regarded as the predisposing, if not the exciting, cause of the brain murmur. He calls attention to a fact of great importance in this connection: in two cases there were found, *post mortem*, enlarged and hard lymph glands in the course of the carotid arteries, and in all children examined subsequently, in whom the murmur was heard, the presence of en-

¹ Loc. cit.

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larged glands in this situation was determined. He suggests that the murmur may be due to this cause.

So far as my limited experience goes, I am not inclined to regard the murmur as of any special pathological significance. There can be no doubt, however, from the numerous observations of French and German physicians, that it occurs most frequently in weak, rickety children, but its presence and persistence in perfectly healthy infants are sufficient to disprove the peculiar connection which some have supposed it to have with this disease. Thus I have had a strong, well-developed child under observation since birth; the murmur appeared at the fourth month, and has now continued for twenty-two months, with little or no change. Though not prepared to criticise Jurasz's ingenious view, not having entered into the anatomical question, I think that the cases of the little girl above mentioned, in whom the murmur has lasted for six years, and the infant in which I have followed it for twenty-two months, are strongly opposed, if not fatal, to any such theory. If the carotid canal is widened by the pulsation of the artery, it is scarcely conceivable that a *physiological stenosis* could persist for six years.

I have not been able to detect any special enlargement in the cervical glands along the carotids in the cases which have come under observation since receiving Epstein's pamphlet. In one case there were two enlarged and firm glands behind the sterno-mastoid muscle on the right side. Unless the enlargement is considerable, it is difficult to feel the deep glands along the carotids, particularly if the child is well nourished. Epstein's suggestion is, however, worthy of further investigation.